

III.—On *Meiolania* and some Points in the Osteology of the *Testudinata*: a Reply to Mr. G. A. Boulenger. By Dr. G. BAUR.

[Plate VI.]

IN the February number of the 'Annals and Magazine of Natural History' I find some remarks by Mr. G. A. Boulenger in reply to my article on the systematic position of *Meiolania* published in the January number. Nearly all the comments of Mr. Boulenger need an answer.

1. "After having thought *Miolania* to be allied to *Staurotypus*, Dr. Baur now regards this Chelonian as representing a highly specialized branch of the true land-tortoises." . . .

Many people may think from this statement that I have published such a view on *Meiolania*; this I never did. The fact is that during my visit in London last August and September I had some talk with Mr. Boulenger on *Meiolania*. I said that the skull *looks* very much like that of *Staurotypus*, and showed to Mr. Boulenger the cervicals of *Staurotypus triporcatus*, so kindly sent to me by Prof. v. Krauss for examination; this was all. I had not yet reached a *definite* conclusion on the systematic position of *Meiolania* among the Cryptodira when I left London; this was only obtained here after a careful examination and comparison.

2. "Dr. Baur's theory of the specialization from a land-Testudinoid, viz. a type with extremely reduced tail, with procœlous vertebræ and no chevrons" "is inadmissible."

Of course *Meiolania* did not come from any of the living forms of the Testudinidæ. This I have clearly shown in my remarks on the quadrate with an open fissure, which we find in *Meiolania*. That some of the fossil Testudinidæ, like *Hadrianus*, Cope, from the Eocene, showed such conditions is possible, but we have no proof yet. Besides that, I think it probable that after a careful study of the tails of the different land-tortoises we may find conditions somewhat similar to those in *Meiolania*. I only note Blyth's remarks on "*Scapia*," a form very much like *Hadrianus*. According to him there is "a group of five principal obtuse spines on either side of the tail, the medial of them remarkably strong and thick; two or more smaller spines or thick elongate scales above the tail." I do not know "*Scapia*"*; but these spines seem to indicate a longer tail, as in the other Testudinidæ. I think my discovery of opisthocœlian vertebræ in a land-

* Probably only a species of *Manouria*.

living form of the Emydidae, the "wood-tortoise" (*Clemmys insculpta*, Le C.), is a very good support of the correctness of my view.

3. "Dr. Baur has arrived at some curious misconceptions from not examining sufficient material, and, what is still less excusable, by not carefully perusing the standard works on the osteology of Reptiles. Thus, for example, he entirely ignores the cranial structure of *Chelys*, the type, in a systematic sense, of the Pleurodira, which has been figured by Cuvier, Wagler, Brühl, Hoffmann, and Mivart. He will find, by referring to *Chelys*, that his character of 'the quadrate connected with the basisphenoid, sometimes with the basioccipital,' falls to the ground."

I should say that Mr. Boulenger knows what I intended to express by the words "*the quadrate connected with the basisphenoid*"—it was *the fact, that in all Pleurodira the pterygoids do not separate the quadrate and basisphenoid, as in the Cryptodira*. This fact I defined by the words, not applicable to *Chelys*, "*the quadrate connected with the basisphenoid*." But *Chelys* makes no exception from the other Pleurodira; *even here the pterygoids do not separate the quadrate and basisphenoid*. But these bones are separated by the petrosal nearly in the same way as in *Pelomedusa* and *Hydromedusa* (Peters), in which forms a small connexion between quadrate and basisphenoid still exists. I said that Mr. Boulenger knows what I wanted to express by the words "*the quadrate connected with the basisphenoid*." I made him acquainted personally with the new character of the Pleurodira, found in the pterygoids; besides that, every body can see what I meant if he reads the words immediately following the above statement—"in all the Cryptodira and the Trionychioidea the pterygoids extend between these elements."

It was a wrong expression, but not ignorance!

4. The absence in the Pleurodira of the descending processes of the præfrontals, which connect the vomer, is a character of no great importance according to Mr. Boulenger.

a. That the connexion between the vomer and the "præfrontals does not exist in the living Pleurodira is perhaps due to the fact that the vomer is absent in the Pelomedusidae."

To that I answer with the fact that the Cretaceous *Bothremys*, Leidy, has a very strong vomer, but *no* connexion between the vomer and the præfrontals.

b. "In *Chelys* and *Chelodina* a complete bony orbito-nasal septum is formed by connexion of the præfrontals with the palatines."

I cannot find a "*complete bony orbito-nasal septum*" in

Chelodina (*Chelys* not at hand). Besides, this would have nothing to do with the condition found in the Cryptodira. To explain this I give a description of the relations between præfrontals, palatines, and vomer in the Testudinata.

In all the Cryptodira the præfrontals show two inferior processes: one which we call the inner process is connected with the vomer and the inner portion of the palatines; the other, the outer process, is connected with the maxillary, or may even reach the outer portion of the palatines. Between these two processes and the palatines and maxillaries we find the foramen nasopalatinum.

a. *Cryptodira*.

Chelydridæ, Dermatemydidæ, Staurotypidæ, Cinosternidæ.

Inner process of præfrontal in extensive connexion with vomer and palatines; outer process in no connexion with palatines.

The Cheloniidæ show the same condition, but in some forms the connexion between the inner process and the palatines has gone. We may distinguish the following stages:—

Euclestes.—Like Chelydridæ.

Chelonia.—Inner processes clearly connected with palatines.

Thalassochelys.—The ends of the inner processes touch the palatines.

Colpochelys, *Caretta*.—No connexion between inner processes and palatines

Dermochelydidæ.—Connexion still more reduced; ends of inner processes touching vomer only.

Emydidæ and *Testudinidæ*.—A similar condition to that in Chelydridæ we find in some of the Emydidæ (*Trachemys serrata*, *Ptychemys concinna* and *mobiliensis*). In others the outer præfrontal process begins to touch the palatines (*Malacoclemmys*, *Chrysemys*, *Terrapene*, *Clemmys*). Or in many of the Testudinidæ a strong connexion exists between this process and the palatines; hence the foramen nasopalatinum is formed by the præfrontals and palatines only. This foramen may be very much reduced and nearly disappear (*Emys meleagris*, *Clemmys guttata*, different Testudinidæ, *T. polyphemus*).

β. *Chilotæ*, Wieg.*

The foramen nasopalatinum generally formed by præ-

* I use the name *Chilotæ* in preference to Gray's name *Trionychoidea*, expressing only a superfamily.

frontal, maxillary, palatinum, vomer. The inner process of the præfrontal connected with the vomer, the outer with the maxillary. In *Chitra* and *Cyclanosteus* there is no connexion between præfrontals and vomer; in *Emyda* and "*Baikia*" the inner process of the præfrontals becomes rudimentary.

γ. *Pleurodira*.

The inner process of the præfrontals is absent or rudimentary, there is never a connexion with the vomer and never with the palatines. The outer process is either connected with the maxillary alone or may even touch the palatines.

Podocnemididae.—In *Podocnemis* and *Erymnochelys* (*Dumérilia*) there is no connexion between the outer process of the præfrontals and the palatines. In *Erymnochelys* the inner process is indicated very much more than in *Podocnemis*.

Sternotheridae.—Like *Podocnemididae*, in *Sternotherus niger* the inner process is still more indicated than in *Erymnochelys*.

Chelydidae.—In *Chelymys victorie* the outer process is very near to the palatines, the inner process scarcely present. In *Chelodina longicollis* the ends of the outer process of the præfrontals and the palatines meet; the inner process is more developed, as in *Chelymys*, but not so much as in *Sternotherus*. This is called by Mr. Boulenger a "complete bony orbito-nasal septum."

To sum up. In all *Cryptodira* (if not highly specialized, as some *Cheloniidae* and *Dermochelys*) the inner process of the præfrontals shows a connexion with the palatines and the vomer.

In all *Pleurodira* not only the connexion with the palatines but also that with the vomer is absent.

In all *Testudinata* in which the inner process of the præfrontals is connected with the palatines this process is connected with the vomer also.

Now what do we find in *Meiolania*. There is a small palatonasal opening which is shown on the right side; the inner præfrontal process is connected extensively with the palatines; therefore a connexion must also exist with the vomer.

I may add that this region in *Meiolania* is nearest to the condition found in the *Testudinidae*. But according to Mr. Boulenger "Dr. Baur is not justified in saying that the præfrontals are connected with the vomer in *Meiolania*."

5. Mr. Boulenger claims to be better informed as to the

condition of the pterygoids than I am, "who, after examining merely the cast, thinks the lateral expansion of the pterygoids 'may be produced by crushing of the edges.'" But Mr. Boulenger forgets to state that I remarked, "even if it [the expansion] were natural, it would not be of great importance." This is a great difference. I did not think *only* that the edges are crushed; I admitted the other possibility that they are natural. I believe Mr. Boulenger when he says that they are natural, but even then this makes no difference. Such expansions are indicated in some of the Testudinidæ (conf. *Testudo elephantina*, Günther, 'Gigantic Land-Tortoises,' pl. ix. fig. A); and, as I stated before, in the Chilotæ we find all conditions of these expansions.

6. To Mr. Boulenger it seems extremely probable that [in *Meiolania*] "the quadrate did join the basisphenoid, as in *Podocnemis*." But I miss the reasons for this probability.

7. "The back of the skull of *Meiolania* is as typically Pleurodiran as can be, and totally different from that of the Testudinidæ." The complete bony ring is "decidedly held to be formed by the quadrate." Also here I miss the reasons.

8. "How Dr. Baur has acquired his information respecting the characters of the Pleurodiran cervical vertebræ as compared with the Cryptodiran is a puzzle to" Mr. Boulenger.

My information was acquired by the examination of many hundreds of Testudinata in the museums of this country and in Europe; and I have not to change a single point in my statements.

I said, "1. The centrum of the first vertebra [of the Pleurodira] (the so-called odontoid process) is absolutely free from the second, with which it articulates freely." In the Cryptodira "it is not absolutely free from the second, but more or less connected."

This is the fact; if the cervical vertebræ of a Pleurodiran are macerated the centrum of the atlas becomes free from the centrum of the axis; in the Cryptodira it remains more or less connected.

9. "Better than any lengthy discussion, the following figures will show whether Dr. Baur is justified in stating that an 'atlas-ring' is absent in the Pleurodira and that the centrum alone supports the neuroids of the atlas."

At first I have to protest against misstatements. I have never said that the centrum *alone* supports the neuroids. *I have clearly stated that in the Podocnemididæ the first inter-centrum is "slightly connected with the neuroids."* In regard to the atlas-ring I may say the following: an atlas-ring is

formed by the connexion of the neuroids with the first intercentrum (atlas-ring of birds and mammals). Such a ring does not exist in the Pleurodira, so far as I know. If the atlas of a Pleurodiran is macerated the intercentrum, if not coossified with the centrum, becomes free; it does not remain in connexion with the neuroids; these generally are united with the centrum or may become free, as in the Podocnemididæ (*Podocnemis Dumeriliana* and *expansa*) and some Chelydidæ (*Elseya* according to Vaillant). But if we macerate the atlas of a Cryptodiran we never find, so far as I know, that the neuroids of the atlas remain in connexion with the centrum; the neuroids of the atlas are connected with the intercentrum, or all parts may become separated, as in the Chelydridæ, Cheloniidæ. This I wanted to state, and therefore I used the words "it is the centrum which supports the neuroids of the atlas" in the Pleurodira. I excluded the Podocnemididæ, stating that the intercentrum also takes some part.

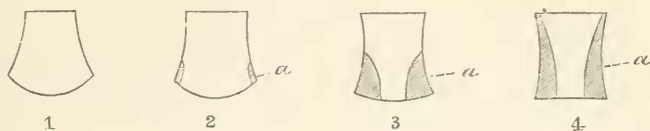
If we compare Mr. Boulenger's figures with these remarks there seems to be considerable contradiction.

In the specimen of *Erymnochelys madagascariensis* before me the atlas is missing; but for comparison I give an exact figure of the first two cervicals of *Podocnemis Dumeriliana*. *Podocnemis* and *Erymnochelys* are allied forms, and *Erymnochelys* is even not different from *Podocnemis* according to Mr. Boulenger. We may expect therefore that the first two cervicals show in both similar conditions. As anybody will see, my figures of *Pod. Dumeriliana* are entirely different from those of *Erymnochelys* given by Mr. Boulenger. The neuroids are supported by the atlas centre, the intercentrum is connected a little with the neuroids. The intercentrum is very small compared with the centrum and projects below it.

In *Chelymys victoriæ* we find a similar condition to that in *Pod. Dumeriliana*; but the intercentrum simply touches the neuroids. The neuroids are more connected with the centrum than in *Pod. Dumeriliana*. This condition is very much more expressed in the following genera of the Chelydidæ—*Chelys*, *Hydromedusa*, *Chelodina*, *Hydraspis*—and in the Sternothæridæ; in all these the neuroids have entirely gone on to the centrum, with which they become ossified.

In the Cryptodira the conditions are entirely different. The most generalized arrangement we find in the Cheloniidæ and Chelydridæ, in which the atlas-elements are only loosely connected; but even in these forms the centrum does not support the neuroids. *The connexion between these elements is on a vertical plane, there is no support*; the neuroids are

supported by the intercentrum. The conditions of the centrum of the atlas in the Testudinata may be expressed in the following diagram, in which the centrum is seen from above:—



1. Cryptodira : no face for neuroids.
2. Podocnemididæ : a small face for neuroids.
3. Chelydidæ, part, *Chelymys* (for ex.) : a larger face for neuroids.
4. Chelydidæ, part (Sternotheridæ) : a large face for neuroids.

The conditions of the first two vertebræ in the Cryptodira and Pleurodira could be expressed also in the following way:—In the Cryptodira the atlas-ring has a free articulation with the atlas-centrum; in the Pleurodira the associated neuroids and the atlas-centrum have a free articulation with the centrum of the axis.

10. "With regard to *Meiolania*, I can state that the neuroids of the atlas are supported by both the hypapophysis (first intercentrum) and the centrum, that the latter articulated freely with the second centrum, and that the diapophyses of the second vertebra are not partly below the præzygapophyses, as in all Cryptodira, but entirely behind; in all these respects agreeing with the vertebræ of *Podocnemis madagascariensis* figured above."

In regard to this I state that after a careful comparison of the atlas of *Meiolania* with other specimens I am convinced that the neuroids are exactly in the same connexion as in the Cryptodira, especially the Testudinidæ. They stand entirely on the first intercentrum, with which they are coossified; there is no articular face on the top of the atlas-centrum for the neuroids. Whether the atlas-centrum articulated freely or not is impossible to determine in the specimen, but it is very doubtful that it did articulate freely.

The diapophysis of the axis is a trifle behind the præzygapophysis in *Meiolania*; we have the same, if I remember rightly, in *Staurotypus*; if the diapophysis of *Testudo polyphemus* should become more slender, we would have the same arrangement; the thick basis of the diapophysis would be used up for this, and the diapophysis would be behind the zygapophysis. But this difference is of no importance. In

all the *Pleurodira* known the diapophysis of the second vertebra is in the middle; in all *Cryptodira* it is in front; and so it is in *Meiolania*.

11. "Two adult skeletons of *Testudo polyphemus*" in the British Museum "do not show the slightest resemblance to *Meiolania* in their first and second vertebræ."

I give an exact drawing of the atlas and axis of *Testudo polyphemus* (Pl. VI. figs. 3, 4) (no. 645 Peabody Mus.) and of *Meiolania* (fig. 5) *, and leave it to the judgment of the readers whether they are alike or not. Besides that I give a description of these vertebræ.

Meiolania.

Atlas.—Intercentrum coossified with neuroids of atlas, between intercentrum and each neuroid a foramen. Centrum very short, entirely free from intercentrum, convex in front, concave behind; intercentra two, coossified with the posterior part of the centrum, forming two processes behind; no face for neuroids on the upper part of centrum; anterior face convex, forming a ball, which moves in the posterior articular face of the atlas-ring.

Axis.—Centrum strongly emarginate behind, no keel on lower face; probably concave behind; a strong diapophysis directly behind and below præzygapophysis, but in front of centrum, not in the middle; diapophyses not directed backwards.

Testudo polyphemus (typical specimen from Florida).

Atlas.—Intercentrum coossified with neuroids in very old specimens; between intercentrum and each neuroid a foramen, which may be open behind. Centrum very short, entirely free from intercentrum, convex in front, concave behind; intercentra two, coossified with the posterior part of centrum in old specimens (suture still visible in no. 645), forming two processes behind; no face for neuroids on the upper part of centrum; anterior face convex, forming a ball, which moves in the posterior articular face of the atlas-ring.

Axis.—Centrum strongly emarginate behind, no keel on lower face; concave behind, a pretty strong diapophysis, anterior face a little below, posterior entirely behind præzygapophysis; in front of centrum, not in the middle. Diapophyses not directed backwards.

I beg to compare the figures and description of the first

* The drawing is made from the cast; the single elements of the vertebræ are placed in the natural position.

two vertebræ of *Meiolania* with the same elements of any Pleurodiran. There is a fundamental difference. *These vertebræ are typically Cryptodiran in Meiolania.*

12. "If Dr. Baur were acquainted with the structure of the hyoid in the Pelomedusidæ he could not have pointed to the character of the hyoid bones as proving the Testudinoid nature of *Meiolania*."

The hyoid apparatus of *Sternotherus niger* before me is very different from that of *Meiolania*. The copula and the proximal parts of the third pair of cornua are entirely coossified; in *Meiolania* we only have the ossified great cornua, and these show some resemblance to the same elements in *Sternotherus*; but such a similarity is not an affinity. I do not know the hyoids of *Pelomedusa*. In young specimens of *Podocnemis* only the great cornua are ossified.

EXPLANATION OF PLATE VI.

Fig. 1. Atlas of *Podocnemis Dumeriliana*, front view, $\frac{1}{2}$.

Fig. 2. Atlas and axis of *Podocnemis Dumeriliana*, from below, $\frac{1}{2}$.

Fig. 3. Atlas of *Testudo polyphemus*, front view, $\frac{2}{3}$.

Fig. 4. Atlas and axis of *Testudo polyphemus*, from below, $\frac{2}{3}$.

Fig. 5. Atlas, axis, and part of occipital condyle of *Meiolania platyceps*, $\frac{1}{2}$, from below. The elements are placed in the right position.

i^1 =intercentrum 1.

i^2 =intercentrum 2.

o =condyle.

c =centrum of atlas.

c^1 =centrum of axis.

New Haven, Conn.,

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IV.—Notes on the Histeridæ taken in Venezuela by Mons. E. Simon. By G. LEWIS.

THE object of this paper is to enumerate the species of Histeridæ captured in Venezuela by M. E. Simon during a journey extending through December 1887 to April 1888, and it will form, I believe, one of a series of memoirs relating to other insects taken by him at the same time. Almost every collection made in the warm parts of America brings to light some curious new form of Histerid, and the present one is not an exception. The *Phelister Simoni* noticed here is a most remarkable species and one which I only place in the genus with doubt. As, however, I have given an outline of the sternal structure (which differs so much from the structure in *Phelister venustus*, Leconte, the type of the genus)

those who study the family will be able to form an idea of its peculiarities and to judge whether or not I have assigned it rightly to *Phelister*. The specimen is unfortunately unique and the sex of it is not apparent without dissection; but I cannot for a moment think the structure of the prosternum can differ in the male and female.

List of Species.

<i>Hololepta humilis</i> , Payk.	<i>Epierus brunnipennis</i> , Mars.
<i>Lioderma 4-dentatum</i> , Fabr.	— <i>notius</i> , Mars.
<i>Phelister Simoni</i> , n. sp.	— <i>vagens</i> , Mars.
— <i>4-punctatus</i> , Mars.	— <i>fulvicornis</i> , Fabr.
— <i>globiformis</i> , Mars.	<i>Paromalus sincerus</i> , Lewis.
— <i>hæmorrhous</i> , Mars.	— <i>fissus</i> , Lewis.
— <i>panamensis</i> , Leconte.	<i>Saprinus modestus</i> , Er.
<i>Homalodes vapulo</i> , Mars.	— <i>auctus</i> , Sch. (1889).
— <i>gagatinus</i> , Er.	<i>Idolia scitula</i> , Lewis.
— <i>serenus</i> , Er.	— <i>integra</i> , n. sp.
<i>Hister cænosus</i> , Er.	

Phelister Simoni, n. sp.

Oblongus, convexiusculus, niger, subopacus, undique minutissimo strigosus; antennis pedibusque piceis; fronte punctulata, antice impressa, supra oculos subelevata, stria integra leviter impressa in medio retrorsum acuminata; clypeo separato transverso; pronoto stria integra post oculos minute crenulata, subdense punctulato, punctis grossis intermixtis, ante scutellum triangulariter impresso; clytris striis integris subcrenulatis 5 cum suturali basi conjunctis, undique punctulatis; propygidio pygidioque parum dense punctulatis; prosterno in regione striarum prominulo, bistriato, striis anticis conjunctis, lobo separato; mesosterno antice late arcuato, striis transversis crenulatis; tibiis anticis 5-dentatis.

Long. 3 mill.

The minute surface sculpture of this species gives it the appearance of opacity. The frontal stria is lightly impressed and formed like that figured for *Homalodes faustus* and others in Marseul's monograph. The singular structure of the prosternum may be seen by the figures given here. The region of the striæ is built up to the same plane as the mesosternum and then cut off as it were in a diagonal direction, and at this point a pilose tuft is visible (indicated by punctures in the figures), and the lobe is pro-

